

ROMANIAN
NEUROSURGERY

Vol. XXXVIII | No. 2

June 2024

Anterior cervical surgery for the
treatment of cervigonenic headache
caused by cervical spondylosis. A case
report

Fadhil,
Yunus Kuntawi Aji,
Sabri,
Muhammad Deni Nasution,
Nindi Lizen



Anterior cervical surgery for the treatment of cervigonenic headache caused by cervical spondylosis. A case report

Fadhil¹, Yunus Kuntawi Aji¹, Sabri^{2,3}, Muhammad Deni Nasution^{2,3}, Nindi Lizen^{2,3}

¹ Department of Neurosurgery, National Brain Center Hospital, Jakarta, INDONESIA

² Faculty of Medicine, Universitas Sumatera Utara, Medan, INDONESIA

³ Department of Neurosurgery, H. Adam Malik General Hospital, Medan, INDONESIA

ABSTRACT

Cervicogenic headache (CEH) is a common disorder with cervical spine-specific nociceptive headache symptoms. Cervicogenic headaches have been studied for years, but diagnosis and treatment are continually evolving. Due to non-specific criteria and its relationship with cervical degenerative illness, diagnosis may be underestimated. In many situations, it contributes to myelopathy or radiculopathy. Local anaesthetic blocks are used to confirm the diagnosis; however, non-invasive methods are being explored. Identifying the nociceptive origin improves pain management. Physical therapy and percutaneous interventional procedures are used to treat isolated CEH. However, cervical decompression and/or fusion are often performed in situations of cervical myelopathy and/or radiculopathy. Here we report a 57-year-old female with cervicogenic headache treated with anterior lower cervical discectomy to relieve cervical myelopathy and/or radiculopathy headaches.

INTRODUCTION

Cervicogenic headache (CEH) is common and recurring. The prevailing belief is that the source of discomfort is in the head, although the actual site of the lesion is situated in the neck. Depending on diagnostic criteria, chronic headache (CHE) prevalence varies in the general population. CEH is estimated to affect 1-4.1% of the population.¹ The International Headache Society (IHS) defined cervicogenic headache (CEH) in 2018 as a headache caused by cervical spine or its disc, bone, or soft tissue disruption. It usually causes neck pain, but can manifest as headache.²

The precise etiology of CEH is inadequately comprehended. Referred pain, caused by upper cervical nerve degeneration (C1-C3) has long been known. However, cervical spondylosis is most common in the

Keywords
surgery,
cervigonenic headache,
cervical spondylosis



Corresponding author:
Fadhil

National Brain Center Hospital,
Jakarta, Indonesia

mousaabdurrahman06@gmail.com

Copyright and usage. This is an Open Access article, distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is unaltered and is properly cited.

The written permission of the Romanian Society of Neurosurgery must be obtained for commercial re-use or in order to create a derivative work.

ISSN online 2344-4959
© Romanian Society of
Neurosurgery



First published
June 2024 by
London Academic Publishing
www.lapub.co.uk

lower cervical spine (vertebrae C4 to C7) and rare in the upper cervical spine (vertebrae 5 and 6).²

A recent retrospective study found that anterior lower cervical discectomy may relieve concurrent cervicogenic headache (CEH) according to ICHD-3 beta.³ Multicenter randomized clinical trial has shown that anterior lower cervical discectomy relieves cervical myelopathy and/or radiculopathy headaches. As shown by follow-up examinations, this intervention's benefits last up to 7 and 10 years.⁴ Yang et al reported anterior cervical decompression and fusion (ACDF) can effectively relieve CEH associated with cervical myelopathy and/or radiculopathy.⁵

CASE REPORT

The patient was a 57-year-old Asian female. Her chief complaint was pain headache especially at occipital region worsening in the last 1 year. The pain referred to retro-orbital and left face. She had history of surgery for the left face pain. No abnormality was noted on neurological examination, and only age-related changes were observed on a head magnetic resonance imaging (MRI) scan, showing no abnormality causing headache.

Cervical Xray showed spondylosis cervical with straight cervical and narrowing of intervertebralis disc C4/C5, C5/C6, C6/C7 in flexion and extension position. Patient was diagnosed with cervicogenic headache /cervico cephalic syndrome and spondylosis cervical. Under general anesthesia, ACDF C4-5, C5-6 was performed. After surgery, no new neurological abnormality or other complications developed. Early post operation headache was improved and completely disappear at one month post operation.



Figure 1. Cervical Xray pre-operation.

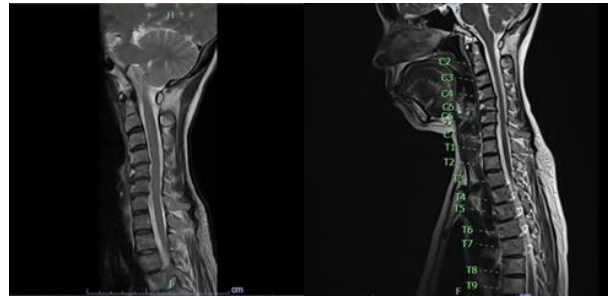


Figure 2. MRI Cervical pre-operation,

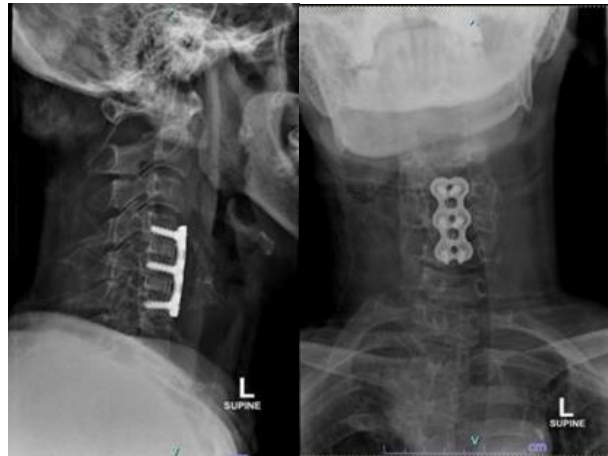


Figure 3. Cervical Xray post operation.

DISCUSSION

Currently, there is a lack of consensus regarding the optimal treatment for CEH due to limited understanding of the underlying mechanism responsible for this form of pain. The therapeutic interventions employed in clinical practice encompass a spectrum of approaches, varying in invasiveness. These include conservative measures such as rest, application of heat, physical therapy involving massage, administration of nonsteroidal anti-inflammatory drugs and muscle relaxants, as well as the utilization of oral anticonvulsant medications. In more severe cases, surgical techniques may be employed as a therapeutic modality. However, none of the aforementioned treatments have demonstrated sufficient results and provide substantial evidence to be considered the optimal therapy for CEH.⁶

Several studies have been conducted to examine the various impacts of anterior cervical surgery on headaches linked to cervical myelopathy and/or radiculopathy in the short, medium, and long term.⁷ It is important to note that headaches associated

with cervical spondylosis should not be equated with "cervicogenic headache".⁸

The concept of cervicogenic headache (CEH) coming from the lower cervical spine was initially introduced by Diener *et al.* Their study revealed that in 80% of patients with lower cervical disc herniation (below C4), CEH showed improvement or resolution following surgical intervention.⁹

Nociceptive afferent originating from the lower cervical roots additionally converged upon the trigeminocervical nucleus.^{7,8} The distribution of nerves inside the cervical intervertebral region is innervated in a multisegmental manner. The trigeminocervical nucleus has the potential to receive afferent input from both the C1-C3 spinal nerves as well as partially from the C4-C8 nerves. The present study has discovered a correlation between cervical spondylosis in the lower cervical spine and cervicogenic headache (CEH). Furthermore, it has been observed that anterior cervical discectomy and fusion (ACDF) surgery might lead to a substantial improvement in CEH. These findings suggest the possibility of nociceptive afferents originating from lower cervical neurons converging onto the trigeminocervical nucleus.^{9,10}

Intervertebral disc degeneration is the prevailing pathological alteration observed in cases of cervical spondylosis. The prevalence of chronic neck discomfort has been widely acknowledged to be associated with degenerative cervical intervertebral disc conditions.¹¹

It is postulated that the inflammatory response triggered by the degeneration of cervical discs could potentially activate nociceptors within the intervertebral discs of the neck, thereby leading to the manifestation of neck pain. Simultaneously, the nociceptive excitabilities are sent to the trigeminocervical nucleus located in the upper cervical spinal cord, leading to the manifestation of chronic episodic headache (CEH). Indeed, the presence of cervical radiculopathy or myelopathy can lead to the irritation or compression of cervical nerve roots or the spinal cord, which in turn might impact the nociceptive afferents of the affected cervical intervertebral disc and perhaps exacerbate headaches.^{12,13} Hence, it is posited that anterior cervical discectomy and fusion (ACDF) may potentially enhance cervical epidural hematoma (CEH) by eliminating the degenerative cervical disc together with its internal nociceptors, as well as by

decompressing the cervical nerve root or spinal cord. Furthermore, it should be noted that posterior laminoplasty has the potential to alleviate cervical spondylotic myelopathy by means of indirect decompression of the spinal cord. Nevertheless, it should be noted that laminoplasty has been found to have a lower level of durability compared to anterior cervical fusion in terms of providing relief from headaches.¹⁴

Various ideas have been proposed in the existing literature to elucidate the etiology of cervicogenic headache (CEH) in the lower cervical spine. Bogduk and Govind proposed that a direct link between the lower cervical afferents and the trigeminocervical nucleus is not evident. However, they hypothesized the involvement of intermediary mechanisms, such as secondary spinal kinesthesia and muscular tension, which might potentially impact the upper cervical joints. The efficacy of headache alleviation may vary depending on whether anterior arthroplasty or fusion is employed, particularly when considering the specific mechanism of spinal kinesthesia.¹⁵ Lombardi *et al.* conducted a prospective, multicenter study with a 10-year follow-up to examine the efficacy of arthroplasty and ACDF in alleviating headaches related to cervical radiculopathy and/or myelopathy. Their post-hoc analysis revealed that both interventions were effective in relieving headaches, but the arthroplasty group exhibited lower headache scores compared to the ACDF group. This finding provides evidence for the involvement of spine kinematics in the development of cervicogenic headache.¹⁶

Additional hypothesized processes include the potential involvement of the sinuvertebral nerve (SVN) or irritation of the sympathetic nerve at the uncovascularadicular junction, anterior dura mater, or cervical posterior longitudinal ligament (PLL). The cervical dura and posterior longitudinal ligament (PLL) possess distinct sympathetic innervation, which can potentially elicit sympathetic responses.¹⁷ The activity has the potential to traverse the ganglia and the sympathetic trunk, ultimately reaching the trigeminocervical nucleus, hence potentially triggering craniofacial pain.

Furthermore, irritation of the spinal accessory nerve (SVN) at the uncovascularadicular junction and anterior dura could potentially be the underlying factor contributing to cervicogenic headache (CEH). Given that the inferior branch of the spinal trigeminal

nucleus (SVN) has the capacity to extend to three segments below its point of origin, nociceptive signals originating from the lower cervical segment, specifically C6, can transmit to the third cervical nerve and subsequently to the trigeminocervical nucleus. This process ultimately contributes to the development of cervicogenic headache (CEH). Both anterior cervical surgery and posterior decompression have been shown to alleviate headache symptoms.¹⁵

Three surgical interventions, including ACDF (anterior cervical discectomy and fusion), arthroplasty, and laminoplasty, exhibit substantial efficacy in relieving headache symptoms.¹⁵

CONCLUSION

Neck discomfort is a common symptom observed in cases of cervical spondylosis that are aggravated with cervicogenic headache (CEH). The anterior cervical discectomy and fusion (ACDF) procedure has been shown to be a successful intervention for the alleviation CEH symptoms in patients with concurrent cervical myelopathy and/or radiculopathy.

REFERENCES

- Bogduk N, Govind J. Cervicogenic headache: an assessment of the evidence on clinical diagnosis, invasive tests, and treatment. *Lancet Neurol* [Internet]. 2009;8(10):959–68. Available from: [http://dx.doi.org/10.1016/S1474-4422\(09\)70209-1](http://dx.doi.org/10.1016/S1474-4422(09)70209-1)
- Olesen J. Headache Classification Committee of the International Headache Society (IHS) The International Classification of Headache Disorders, 3rd edition. *Cephalgia*. 2018;38(1):1–211.
- Pang X, Liu C, Peng B. Anterior cervical surgery for the treatment of cervicogenic headache caused by cervical spondylosis. *J Pain Res*. 2020;13:2783–9.
- Thind H, Ramanathan D, Ebinu J, Copenhaver D, Kim KD. Headache relief is maintained 7 years after anterior cervical spine surgery: Post hoc analysis from a multicenter randomized clinical trial and cervicogenic headache hypothesis. *Neurospine*. 2020;17(2):365–73.
- Yang L, Li Y, Dai C, Pang X, Li D, Wu Y, et al. Anterior cervical decompression and fusion surgery for cervicogenic headache: A multicenter prospective cohort study. *Front Neurol*. 2022;13:1–10.
- Liu H, Ploumis A, Wang S, Li C, Li H. Treatment of Cervicogenic Headache Concurrent with Cervical Stenosis by Anterior Cervical Decompression and Fusion. *Clin Spine Surg*. 2017;30(8):E1093–7.
- Liu JJ, Cadena G, Panchal RR, Schrot RJ, Kim KD. Relief of Cervicogenic Headaches after Single-Level and Multilevel Anterior Cervical Discectomy: A 5-Year Post Hoc Analysis. *Glob Spine J*. 2016;6(6):563–70.
- Huang WC, Chen SP, Wang SJ. Are surgically remediable headaches associated with cervical spondylosis equivalent to “cervicogenic headaches”? *Neurospine*. 2020;17(2):374–6.
- Diener HC, Kaminski M, Stappert G, Stolke D, Schoch B. Lower cervical disc prolapse may cause cervicogenic headache: Prospective study in patients undergoing surgery. *Cephalgia*. 2007;27(9):1050–4.
- Persson LCG, Carlsson JY, Anderberg L. Headache in patients with cervical radiculopathy: A prospective study with selective nerve root blocks in 275 patients. *Eur Spine J*. 2007;16(7):953–9.
- Peng B, DePalma MJ. Cervical disc degeneration and neck pain. *J Pain Res*. 2018;11:2853–7.
- Bir SC, Nanda A, Patra DP, Maiti TK, Liendo C, Alireza M, et al. Atypical presentation and outcome of cervicogenic headache in patients with cervical degenerative disease: A single-center experience. *Clin Neurol Neurosurg*. 2017;159(May):62–9.
- Sun Y, Muheremu A, Yan K, Yu J, Zheng S, Tian W. Effect of different surgical methods on headache associated with cervical spondylotic myelopathy and/or radiculopathy. *BMC Surg* [Internet]. 2015;15(1):3–9. Available from: <http://dx.doi.org/10.1186/s12893-015-0092-3>
- Shimohata K, Hasegawa K, Onodera O, Nishizawa M, Shimohata T. The Clinical Features, Risk Factors, and Surgical Treatment of Cervicogenic Headache in Patients With Cervical Spine Disorders Requiring Surgery. *Headache*. 2017;57(7):1109–17.
- Schrot RJ, Mathew JS, Li Y, Beckett L, Bae HW, Kim KD. Headache relief after anterior cervical discectomy: post hoc analysis of a randomized investigational device exemption trial: clinical article. *J Neurosurg Spine*. 2014. 21:217–22. doi.
- Lombardi JM, Vivas AC, Gornet MF, Lanman TH, McConnell JR, Dryer RF, et al. The effect of ACDF or arthroplasty on cervicogenic headaches: a post hoc analysis of a prospective, multicenter study with 10-year follow-up. *Clin Spine Surg*. 2020. 33:339–44.
- Yamada H, Honda T, Yaginuma H, Kikuchi S, Sugiura Y. Comparison of sensory and sympathetic innervation of the dura mater and posterior longitudinal ligament in the cervical spine after removal of the stellate ganglion. *J Comp Neurol*. 2001. 434:86–100.